

WHAT IS CLAIMED IS:

1. A vibration wave actuator apparatus which
excites a vibration member and obtains a driving force
by applying a frequency signal to a driving
5 electro-mechanical energy conversion element mounted on
the vibration member, comprising:

10 a driven state detecting unit which detects a
vibration state of the vibration member, said driven
state detecting unit including a monitor unit which
outputs a waveform signal having an amplitude
corresponding to the vibration state of the vibration
member, a pulse width forming circuit which forms a
pulse width signal by comparing a signal from said
15 monitor unit with a threshold, and a determining
circuit which determines the driven state in accordance
with the pulse width.

2. An apparatus according to claim 1, wherein
said comparing circuit comprises a plurality of
20 circuits having different thresholds, and said pulse
width forming circuit forms a pulse width signal having
a value corresponding to a comparison result from each
of said comparing circuits.

25 3. An apparatus according to claim 2, wherein
said determining circuit selects a predetermined pulse
width signal of the pulse width signals, and determines

1002221 02222001

a vibration state in accordance with the selected signal.

4. An apparatus according to claim 3, wherein
5 said determining circuit selects a pulse width signal of the pulse width signals which has a minimum value other than 0.

5. An apparatus according to claim 1, wherein
10 said apparatus further comprises a converting circuit which converts a signal from said monitor unit into a plurality of signals having different values, said pulse width forming circuit includes a comparing circuit comparing the respective converted signals, and
15 said pulse width forming circuit forms a pulse width signal having a value corresponding to each comparison result from said comparing circuit.

6. An apparatus according to claim 5, wherein
20 said determining circuit selects a predetermined pulse width signal of the pulse width signals, and determines a vibration state in accordance with the selected signal.

7. An apparatus according to claim 6, wherein
25 said determining circuit selects a pulse width signal of the pulse width signals which has a minimum value

10022520-12001

other than 0.

8. A control apparatus for a vibration wave actuator including a driving unit which forms driving vibrations in a vibration member by applying a frequency signal to an electro-mechanical energy conversion element mounted on the vibration member, and a driven state detecting unit which detects a driven state of the vibration member, wherein

10 said driven state detecting unit comprises a state detecting unit which detects a driven state of the vibration member and outputs a waveform signal having an amplitude corresponding to the driven state, a comparing circuit which compares an output waveform signal from said state detecting unit with one or a plurality of thresholds and outputs a pulse signal, a pulse width detecting circuit which detects a pulse width or pulse widths of one or a plurality of pulse signals output from said comparing circuit, and a

15

20 determining circuit which determines the driven state in accordance with one or a plurality of pulse widths detected by said pulse width detecting circuit.

9. A control apparatus for a vibration wave actuator including a driving unit which forms driving vibrations in a vibration member by applying a frequency signal to an electro-mechanical energy

25

10025501-02522001

conversion element mounted on the vibration member, and
a driven state detecting unit which detects a driven
state of the vibration member, wherein

5 said driven state detecting unit comprises a state
detecting unit which detects a driven state of the
vibration member and outputs a waveform signal having
an amplitude corresponding to the driven state, a
multiplying circuit which multiplies the output
10 waveform signal from said state detecting unit by one
or a plurality of coefficients, a comparing circuit
which compares one or a plurality of multiplication
signals obtained by said multiplying circuit with one
or a plurality of thresholds and outputs a pulse
15 signal, a pulse width detecting circuit which detects
one or a plurality of pulse signals output from said
comparing circuit, and a determining circuit which
determines the driven state in accordance with one or a
plurality of pulse widths detected by said pulse width
detecting circuit.

20

10. An apparatus according to claim 8, wherein
said determining circuit determines a vibration
amplitude of the waveform signal in accordance with the
pulse width.

25

11. A control apparatus for a vibration wave
actuator including a driving unit which forms driving

1002520-122001
vibrations in a vibration member by applying a
frequency signal to an electro-mechanical energy
conversion element mounted on the vibration member, and
a driven state detecting unit which detects a voltage
5 applied to the electro-mechanical energy conversion
element of the vibration member, wherein

said driven state detecting unit comprises a
comparing circuit which compares the applied voltage
with one or a plurality of thresholds and outputs a
10 pulse signal, a pulse width detecting circuit which
detects a pulse width one or a plurality of pulse
signals output from said comparing circuit, and a
control circuit which increases/decreases the applied
voltage in accordance with one or a plurality of pulse
15 widths detected by said pulse width detecting circuit.

12. A control apparatus for a vibration wave
actuator including a driving unit which forms driving
vibrations in a vibration member by applying a
20 frequency signal to an electro-mechanical energy
conversion element mounted on the vibration member, and
a driven state detecting unit which detects a voltage
applied to the electro-mechanical energy conversion
element of the vibration member, wherein

25 said driven state detecting unit comprises a
multiplying circuit which multiplies the applied
voltage by one or a plurality of coefficients, a

comparing circuit which compares one or a plurality of
multiplication signal obtained by said multiplying
means with one or a plurality of thresholds, and
outputs a pulse signal, a pulse width detecting circuit
5 which detects a pulse width of one or a plurality of
pulse signals output from said comparing circuit, and a
control circuit which increases/decreases the applied
voltage in accordance with one or a plurality of pulse
widths detected by said pulse width detecting circuit.

10

13. A control apparatus for a vibration wave
actuator including a driving unit which forms driving
vibrations in a vibration member by applying a
frequency signal to an electro-mechanical energy
15 conversion element mounted on the vibration member, and
a driven state detecting unit which detects a voltage
applied to the electro-mechanical energy conversion
element of the vibration member, wherein

said driven state detecting unit comprises a state
20 detecting circuit which detects a vibration amplitude
of the vibration member or an inflow current to the
electro-mechanical energy conversion element and
outputs a detection result as a waveform signal, a
first comparing circuit which compares the output
25 waveform signal from said state detecting circuit with
one or a plurality of thresholds and outputs a first
pulse signal, a first pulse width detecting circuit

10022500-12001

which detects a pulse width of the first pulse signal,
a second comparing circuit for comparing the applied
voltage with one or a plurality of thresholds and
outputs a second pulse signal, a second pulse width
5 detecting circuit which detects a pulse width of the
second pulse signal, a phase difference detecting
circuit which detects a phase difference between the
first pulse signal and the second pulse signal, and a
control circuit which, when an output from said first
10 pulse width detecting circuit is larger than a
predetermined value, controls the frequency signal in
accordance with a phase difference detecting result
from said phase difference detecting circuit.

100221 025200